DR-8. CHEMICAL BATH DEPOSITION OF HgSe FILMS BY SODIUM SELENOSULPHATE

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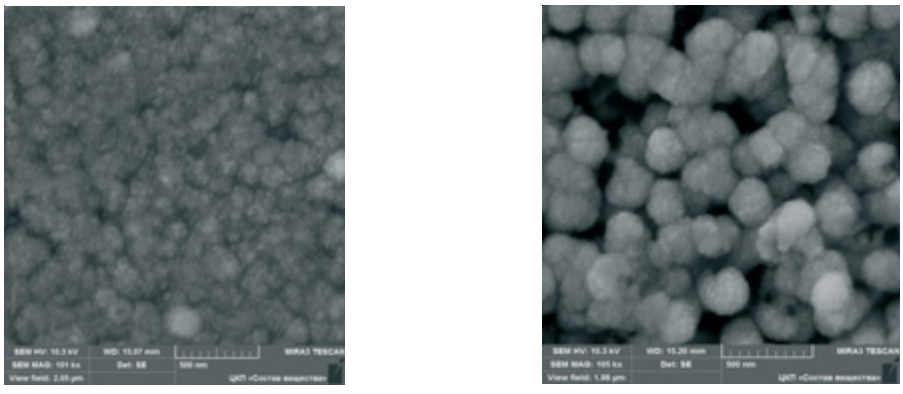
The binary semiconductor of mercury selenide HgSe is interesting as a material for fundamental research due to its unusual band structure and for practical use as infrared detectors, infrared emitters, tunable lasers, ultrasonic and gas sensors, catalysts, reflective materials, solar energy converters, and in spintronics.

In a thin film state, mercury selenide can obtain by chemical vapor deposition (CVD), thermal evaporation, electron beam evaporation, molecular beam epitaxy. These methods require sophisticated high-tech equipment associated with the creation of high pressures and temperatures. In this paper, the chemical bath deposition (CBD) method is used because it is the simplest and economically advantageous.

The chemical bath for the formation of the HgSe film by chemical precipitation included aqueous solutions of mercuric nitrate $Hg(NO_3)_2$, sodium selenosulfate Na_2SeSO_3. KSN potassium thiocyanate was used as the ligand. Also in the second bath potassium iodide KI was added. The precipitation was carried out for 90 min. at 353 K on pre-prepared sittal substrates.

A study of the morphology of HgSe surface has showed that a homogeneous and dense film formed from globular particles of 40–80 nm was obtained from the reaction mixture without potassium iodide (Figure, *a*). The introduction of potassium iodide has resulted in the enlargement of spherical particles to 140–320 nm ((Figure, *b*). Elemental analysis indicates that the surface of HgSe film consists of mercury and selenium, the content of which is 50,8 and 49,2 at.% (in average of ten measurements). The obtained results show almost stoichiometric atomic ratios of mercury to selenium with a small excess of mercury atoms. When KI is introduced into the reactor, more than to 2,66 at.% of iodine enters the film composition, while the selenium content is reduced to 47,14 at.%, and the concentration of mercury is slightly reduced (50,20 at.%).



a *b*

Microelectronic images of HgSe films obtained from the reaction mixture without potassium iodide (*a*) and in its presence (*b*)

Thus, chemical bath deposition is a promising method for obtaining both coarse-grained, and nanostructured semiconductor compounds with different structures and properties.